

Fluid Delivery Apparatus and Method

CLAIM OF PRIORITY

This application is a continuation of Application Serial No. PCT/US01/45192, filed December 3, 2001, which claims priority to U.S. Application Serial No. 09/899,865, filed on July 9, 2001, now U.S. Patent No. 6,442,958, which is a continuation in part of U.S. Application Serial No. 09/732,916, filed on December 11, 2000, now U.S. Patent No. 6,308,528, each of which is incorporated by reference in its entirety.

TECHNICAL FIELD

This invention relates introducing fluid into a fluid system.

BACKGROUND

Leak detection additives can be used to detect leaks in fluid systems, such as climate control systems, hydraulic systems, engine oil systems, automatic transmission systems, fuel systems, brake systems, or radiator coolant systems. Climate control systems include heating, cooling, ventilating, and air conditioning systems. Some leak detection additives are emissive substances such as, for example, fluorescent or phosphorescent dyes. Suitable leak detection additives used in climate control systems include naphthalimide dyes, perylene dyes, thioxanthane dyes, coumarin dyes, or fluorescein dyes. Leaks can be detected by observing light emission from the dye at leak sites by exciting the dye with a light source having suitable wavelength or intensity. In general, the dyes fluoresce brightly when excited by light in the 190 to 700 nanometer wavelength range.

A variety of systems have been developed to introduce leak detection dyes into air conditioning systems. For example, previous injector designs include flow chamber systems and syringe-type systems for introducing liquid dyes into the system. A flow-chamber system generally has a reservoir into which a leak detection dye solution is poured or a dye capsule is loaded and sealed. A carrier is then passed through the reservoir to transport the dye into the system. A syringe-type system generally has a chamber that is loaded by pouring the leak detection dye into the chamber or is preloaded by the manufacturer. The dye is then forced from the chamber into the closed system. Other injector systems include mist diffusers.